IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellants(s):	Leister et al.
Serial No. :	10/537,752
For:	PROCESS FOR PRODUCING BOROSILICATE GLASSES, BORATE GLASSES AND CRYSTALLIZING BORON-CONTAINING MATERIALS
Filed:	December 5, 2005
Examiner:	John M. Hoffmann
Art Unit:	1791
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Commissioner for Patents
P.O. Box 1450
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APPEAL BRIEF FILED UNDER 35 U.S.C. §134

Dear Sir:

Further to the Notice of Appeal filed on October 14, 2009 and the Notice of Panel Decision from Pre-Appeal Brief Review dated November 18, 2009, the period for reply having been extended two month up to and including February 18, 2010, the Appeal Brief filed herewith under 35 U.S.C. §134 and 37 C.F.R. §41.37 is believed to comply with the requirements set forth in 37 C.F.R. §41.37(c).

(1) Real Party in Interest

The real party in interest is Schott AG. Ownership by Schott AG is established by assignment document recorded for the present application on December 5, 2005 on Reel 017579, Frame 0838.

(2) Related Appeals and Interferences

The undersigned attorney is not aware of any related patent applications or patents involved in any appeal or interference proceeding.

(3) Status of the Claims

Claims 6-7 and 23-27 have been cancelled. Dependent claims 10, 12, and 20-21 have been withdrawn, but remain pending for rejoinder upon allowance of any of generic claims 1-8, 11, and 14-18. Accordingly, claims 1-5, 8-9, 11, 13-19, 22, and 28-37 are the subject of this Appeal. Claim 1 is the sole independent claim.

Independent claim 1, as well as dependent claims 2-5, 11, 13-19, and 22, were finally rejected under 35 U.S.C. §103(a) over Appellants' own International Publication No. WO/2001/53222 to Kunert et al. (Kunert) in view of U.S. Patent No. 6,713,419 to Onozawa et al. (Onozawa). Dependent claims 8-9 were finally rejected under 35 U.S.C. §103(a) over Kunert and Onozawa in further view of U.S. Patent No. 6,817,212 to Romer et al. (Romer).

Independent claim 1, as well as dependent claims 29 and 37, were finally rejected under 35 U.S.C. §103(a) over Kunert in view of U.S. Patent No. 3,193,400 to Geffcken (Geffcken).

Independent claim 1, as well as dependent claim 28, were rejected under 35 U.S.C. §103(a) over Kunert in view of U.S. Patent No. 5,648,302 to Brow et al. (Brow).

Independent claim 1, as well as dependent claim 30, were finally rejected under 35 U.S.C. §103(a) over Kunert in view of U.S. Patent No. 4,358,544 to Skedgell (Skedgell).

Independent claim 1, as well as dependent claims 30-36, were finally rejected under 35 U.S.C. §103(a) over Kunert in view of U.S. Patent No. 3,963,505 to Dumesnil (Dumesnil).

In sum, independent claim 1 stands finally rejected under 35 U.S.C. §103(a) over Kunert in view of each of Onozawa, Geffcken, Brow, Skedgell, and Dumesnil.

(4) Status of Amendments

No amendment or response after the Final Rejection dated July 14, 2009 was filed in the present application.

(5) Summary of claimed subject matter

Independent claim 1 reads on the process of elected Group I, Species A (claim 9), Species D (claim 13), Species E (claim 19), and Species H (claim 22). In addition, claims 1-8, 11, and 14-18 were determined by the Examiner to be generic to Species A through H.

The claimed invention as set forth in independent claim 1 advantageously provides a process for producing a borate-containing, low-alkali material. **See page 4, lines 12-20**. The process includes induction-heating a boron-containing melting material directly in an appliance using an alternating electromagnetic field. **See page 9, lines 20-35**. The boron-containing melting material includes at least one metal oxide having metal ions with a valency of at least two. **See page 4, lines 26-35**. The at least one metal oxide being in a quantitative proportion of at least 25 mol%, and the boron-containing melting material having a $B_2O_3/(B_2O_3 + SiO_2)$ ratio of greater than or equal to

0.5. **See page 27, lines 1-20, Table 2, and Table 3**. The appliance comprises a skull crucible in which the boron-containing melting material is melted, the skull crucible has walls that comprise cooled tubes that are spaced apart from one another by a spacing of between 2 mm and 4 mm. **See page 12, line 6 through page 13, lines 6**. In addition, the process includes supplying coolant to the cooled tubes to prevent the boron-containing melting material from running out from between the spaced apart cooled tubes. **See page 10, lines 11-30.**

(6) Grounds of rejection to be reviewed on appeal

(a) First Ground - The first ground presented for review is the propriety of the final rejection of claims 1-5, 8-9, 11, 13-19, and 22 under 35 U.S.C. §103(a) over Kunert in view of Onozawa.

(b) Second Ground - The second ground presented for review is the propriety of the final rejection of claims 1, 29, and 37 under 35 U.S.C. §103(a) over Kunert in view of Geffcken.

(c) Third Ground - The third ground presented for review is the propriety of the final rejection of claims 1 and 28 under 35 U.S.C. §103(a)over Kunert in view of Brow.

(d) Fourth Ground - The fourth ground presented for review is the propriety of the final rejection of claims 1 and 30 under 35 U.S.C. §103(a) over Kunert in view of Skedgell.

(e) Fifth Ground - The fifth ground presented for review is the propriety of the final rejection of claims 1 and 30-36 under 35 U.S.C. §103(a) over Kunert in view of Dumesnil.

(7) Arguments

(a) First Ground - Claims 1-5, 8-9, 11, 13-19, and 22 stand or fall together

Claims 1-5, 8-9, 11, 13-19, and 22 were finally rejected under 35 U.S.C. §103(a) over Kunert in view Onozawa. Appellants respectfully maintain that the Final Office Action, as well as the subsequent Advisory Action, improperly rejected claims 1-5, 8-9, 11, 13-19, and 22.

(i) Failure to prove *prima facie* case of obviousness

Claim 1 recites, in part, that the appliance comprises "a skull crucible in which the boron-containing melting material is melted, the skull crucible has walls that comprise **cooled tubes that are spaced apart from one another by a spacing of between 2 mm and 4 mm** (emphasis added)". Further, claim 1 recites, in part, the step of "supplying coolant to the cooled tubes to **prevent the boron-containing melting material from running out from between the spaced apart cooled tubes** (emphasis added)".

The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S.Ct. at 1734 ("While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.")

Appellants respectfully submit that the Office Action and subsequent Advisory Action have failed to meet the burden of establishing a *prima facie* case of obviousness because they have failed to determine the level of skill in the art.

Presuming arguendo that the references show the elements or concepts urged by the Office Action, the Office Action and subsequent Advisory Action have presented no line of reasoning, and we know of none, as to who one skilled in the art is or why that person viewing the collective teachings of the references would have found it obvious to selectively pick and choose various elements and/or concepts from the several references relied upon to arrive at the claimed invention.

Rather, Appellants submit that the collection of references supports the inescapable conclusion that the Office Action has simply pieced the references together to support a rejection on the basis of hindsight.

The Advisory Action asserts that the level of skill in the art is readily evident from the applied art and the cited case law and asserts that there is no requirement that the Office set forth the level of skill when such is clear and where applicant has not shown (or suggested how) the lack of stating such does (or could possibly) have any effect on the finding of obviousness in the present application. See page 4, line 16 through page 5, line 2.

Appellants content that such an assertion finds no basis in law. It is well settled that the question of obviousness is resolved on the basis of the *underlying factual determinations*.

Without such an underlying factual determination, it is impossible for the question of obviousness to be determined. Furthermore, and contrary to the assertion made by the Advisory Action, the burden is entirely on the Office to provide these underlying factual determinations. Thus, Appellants maintain that the Office Action and subsequent Advisory Action have failed to meet its burden of establishing a *prima facie* case of obviousness because the Office Action has failed to determine the level of skill in the art.

(ii) Kunert in view Onozawa fails to render claim 1 obvious

Independent claim 1 is directed to "process for producing a borate-containing, low-alkali material" that includes, in part, the step of "induction-heating a boron-containing melting material" where that material has "a $B_2O_3/(B_2O_3 + SiO_2)$ ratio of greater than or equal to 0.5" and the skull crucible in which this melting step occurs has walls that comprise "a spacing of between 2 mm and 4 mm" between its tubes.

Appellants submit that the proposed combination of Kunert and Onozawa fails to disclose or suggest claim 1.

As disclosed in the present application at least at page 11, line 13 through page 13, line 6, the claimed "spacing" has been determined by the present application to balance two parameters when producing glass in a skull crucible from "boron-containing melting material", which as an extremely low viscosity at the melting temperature.

On the one hand, the extremely low viscosity material results in the formation of a very thin skull layer on the cooling tubes. The very thin skull layer is unable to support its own weight, resulting in melt breaking through the skull layer. In order to avoid this, the present application has determined that the spacing between the tubes should be minimized. On the other hand, there is an increased risk of flashovers when the spacing between the tubes has been minimized. The present application has advantageously determined that the claimed "spacing of between 2 mm and 4 mm" between the tubes balances these two parameters.

While Kunert may disclose that "[S]lits 14 remain between pipes 12 that are adjacent to each other", Appellants maintain that Kunert simply fails to disclose or suggest the necessary spacing between these slits when used in connection with boron-containing melting material as recited by the process of claim 1.

The Office Action asserts that it would have been obvious to have the spacing as large or as small as needed. Appellants disagree.

Rather, Appellants maintain that it would not have been obvious to one skilled in the art, when viewing the "slit" disclosure of Kunert to have the "spacing of between 2mm and 4mm" when melting the "boron-containing melting material" as recited by claim 1.

Appellants maintain that the present application has determined the optimal spacing of the tubes within skull crucibles when used with extremely low viscosity melts to ensure that the thin skull layer that forms on these tubes does not break and do not flashover, which is simply not disclosed or suggested by the Kunert.

The Office Action asserts that that Appellants "appear[s] to be suggesting that just because viscosity is disclosed as affecting the spacing, it is the only relevant variable". In making this assertion, the Office Action states that an engineer would understand that since one is concerned with the weight of the melt, the height of the crucible matters and that if the height is doubled then the pressure at the base of the melt doubles, which would require an increase in the thickness of the crucible.

Unfortunately, the Office Action fails to recognize that increasing the thickness of the crucible has nothing to do with the spacing between the crucible cooling tubes. To the contrary, the spacing between the tubes is independent of the size of the crucible.

Again, in the present application, the spacing of the tubes is not dependent upon the crucible's dimensions in the manner asserted by the Office Action, but dependent upon the melt's properties with the melt having a particular high content of B_2O_3 as compared to SiO_2, as evidenced by the claimed $B_2O_3/(B_2O_3 + SiO_2)$ ratio.

As explained at page 11, line 13 to page 13, line 6 of the present application description, two parameters are used in dimensioning the tubes' spacing, namely the extremely low viscosity at melting temperature and the risk of flashovers.

Appellants have determined the optimal spacing of the tubes when melting the "boron-containing melting material" that has a particular high content of B_2O_3 as compared to SiO_2, as evidenced by the claimed $B_2O_3/(B_2O_3 + SiO_2)$ ratio, which results in an extremely low viscosity at the melting temperature.

The Office Action asserts that the spacing of "2-4mm does not seem that critical" and bases this conclusion on a misunderstanding of the present application.

The Office Action has correctly stated that the present application discloses "[[A]] space amounting to 5 mm or less may be selected in particular for high-melting, high-viscosity melts (emphasis added)". See page 12, lines 14-15.

However, the present application has **also** determined that the spacing of 5mm, which works for high-viscosity melts, fails when used with boron-containing melting materials in the process recited by claim 1, which have an **extremely low viscosity** and a risk of flashovers, rendering the spacing of 2-4mm critical and not obvious.

The Office Action cites to Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), for the proposition that where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device have the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

In the present application, Kunert discloses, in the "background of the invention" a skull crucible device for melting or purifying glass or glass ceramics that includes vertical metal pipes 12 with slits 14 between the pipes. See col. 1, lines 8-20. However,

Kunert fails to disclose or suggest any dimensions for the slits 14 and fails to disclose or suggest any link between the dimensions for the slits and the viscosity of the melt. Rather, other than the broad disclosure of prior art skull devices having slits between its metal pipes, Kunert is totally silent on this point.

As such, Appellants submit that the *Gardner* case has little to do with the instant situation. In fact, Appellants contend that performance of the process recited by claim 1 with the claimed "material" and the claimed "spacing" does in fact perform differently than the prior art device. Specifically, the prior art device was found to be incapable of use with the "material" recited by the process of claim 1.

Instead, Appellants submit that the court in In re Meng, 492 F.2d 843 (CCPA 1974) has made a determination of obviousness in a situation analogous to the instant situation.

The issue in Meng involved a utility patent drawing alleged to render the pending patent application at issue obvious. According to *Meng*, the question to answer was: "would one of ordinary skill in the art, presented with that problem and those ...prior patents -- and totally unaware of appellants solution-- be led to do what appellants did?" (id at 846).

The Meng court did not find the claim at issue obvious in view of the reference. The court arrived at this conclusion "against the background of the scope and content of the prior art, and the level of ordinary skill in the art" (id at 846). The court noted that when the references were read "without the benefit of appellants' teachings", it had nothing to do with the invention at issue. In doing so, the court upheld the well-established rule "references must be evaluated by ascertaining the facts fairly disclosed therein as a whole". In re Schuman 361 F.2d 1008, 1012, 53 CCPA 1251, 1255 (1966) (emphasis added).

Kunert is directed to a skull crucible that includes a plastic coating on the metal pipes to all for the removal of residual glass from the container after use. Thus, Kunert looks to resolve the problems associated with cleaning prior art skull crucibles after use and, not, to optimizing the spacing between the metal pipes to balance the extremely low viscosity at melting temperature and the risk of flashovers.

Applicants submit that it would not have been obvious to one skilled in the art, when viewing the limited disclosure of Kunert, where the device of Kunert was directed to a problem completely unrelated to that solved by claim 1, to have the claimed spacing.

Thus, Appellants submit that the Office Action's conclusion that, when viewed in light of the 5mm value for high-viscosity melts, the claimed spacing of 2mm to 4mm would be read by one skilled in the art as being not critical is clearly erroneous.

The Office Action fails to assert that Onozawa or Romer cure the deficiencies noted above in Kunert. Accordingly, Appellants submit that the Office Action has failed to establish a *prima facie* case of obviousness and has failed to establish that Kunert in view of Onozawa and/or Romer discloses or suggests the "spacing" recited by claim 1.

Accordingly, reconsideration and withdrawal of the rejection to claims 1-5, 8-9, 11, 13-19, and 22 are respectfully requested.

(b) Second Ground - Claims 1, 29, and 37 stand or fall together

Claims 1, 29, and 37 were finally rejected under 35 U.S.C. §103(a) over Kunert in view of Geffcken. Appellants respectfully maintain that the Final Office Action, as well as the subsequent Advisory Action, improperly rejected claims 1, 29, and 37.

For all of the reasons set forth above in the first ground of rejection, Appellants maintain that Kunert fails to disclose or suggest the "process" requiring the "materials"

and "spacing" recited by claim 1.

The Office Action fails to assert that Geffcken cures the deficiencies noted above in Kunert. Accordingly, Appellants submit that the Office Action has failed to establish a *prima facie* case of obviousness and has failed to establish that Kunert in view of Geffcken discloses or suggests the "spacing" recited by claim 1.

Accordingly, reconsideration and withdrawal of the rejection to claims 1, 29, and 37 are respectfully requested.

(c) Third Ground - Claims 1 and 28 stand or fall together

Claims 1 and 28 were finally rejected under 35 U.S.C. §103(a) over Kunert in view of Brow. Appellants respectfully maintain that the Final Office Action, as well as the subsequent Advisory Action, improperly rejected claims 1 and 28.

For all of the reasons set forth above in the first ground of rejection, Appellants maintain that Kunert fails to disclose or suggest the "process" requiring the "materials" and "spacing" recited by claim 1.

The Office Action fails to assert that Brow cures the deficiencies noted above in Kunert. Accordingly, Appellants submit that the Office Action has failed to establish a *prima facie* case of obviousness and has failed to establish that Kunert in view of Brow discloses or suggests the "spacing" recited by claim 1.

Accordingly, reconsideration and withdrawal of the rejection to claims 1 and 28 are respectfully requested.

(d) Fourth Ground - Claims 1 and 30 stand or fall together

Claims 1 and 30 were finally rejected under 35 U.S.C. §103(a) over Kunert in view of Skedgell. Appellants respectfully maintain that the Final Office Action, as well as the subsequent Advisory Action, improperly rejected claims 1 and 30.

For all of the reasons set forth above in the first ground of rejection, Appellants maintain that Kunert fails to disclose or suggest the "process" requiring the "materials" and "spacing" recited by claim 1.

The Office Action fails to assert that Skedgell cures the deficiencies noted above in Kunert. Accordingly, Appellants submit that the Office Action has failed to establish a *prima facie* case of obviousness and has failed to establish that Kunert in view of Skedgell discloses or suggests the "spacing" recited by claim 1.

Accordingly, reconsideration and withdrawal of the rejection to claims 1 and 30 are respectfully requested.

(e) Fifth Ground - Claims 1 and 30-36 stand or fall together

Claims 1 and 30-36 were finally rejected under 35 U.S.C. §103(a) over Kunert in view of Dumesnil. Appellants respectfully maintain that the Final Office Action, as well as the subsequent Advisory Action, improperly rejected claims 1 and 30-36.

For all of the reasons set forth above in the first ground of rejection, Appellants maintain that Kunert fails to disclose or suggest the "process" requiring the "materials" and "spacing" recited by claim 1.

The Office Action fails to assert that Dumesnil cures the deficiencies noted above in Kunert. Accordingly, Appellants submit that the Office Action has failed to establish a *prima facie* case of obviousness and has failed to establish that Kunert in view of

Dumesnil discloses or suggests the "spacing" recited by claim 1.

Accordingly, reconsideration and withdrawal of the rejection to claims 1 and 30-36 are respectfully requested.

Summary

In summary, Appellants respectfully request that the Board of Appeals reverse the final rejections of claims 1-5, 8-9, 11, 13-22, and 28-37 and pass the present application, including withdrawn claims 10, 12, and 20-21 which depend from one or more generic claims, to issuance.

Respectfully submitted,

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(8) Claims Appendix

Claims 1-5, 8-9, 11, 13-19, 22, and 28-37, herein on appeal, are set forth below.

1. A process for producing a borate-containing, low-alkali material, comprising:

induction-heating a boron-containing melting material directly in an appliance using an alternating electromagnetic field, wherein the boron-containing melting material includes at least one metal oxide having metal ions with a valency of at least two, the at least one metal oxide being in a quantitative proportion of at least 25 mol%, and the boron-containing melting material having a $B_2O_3/(B_2O_3 + SiO_2)$ ratio of greater than or equal to 0.5, wherein the appliance comprises a skull crucible in which the boron-containing melting material is melted, the skull crucible has walls that comprise cooled tubes that are spaced apart from one another by a spacing of between 2 mm and 4 mm; and

supplying coolant to the cooled tubes to prevent the boron-containing melting material from running out from between the spaced apart cooled tubes.

2. The process as claimed in claim 1, wherein the alternating electromagnetic field is a high-frequency field.

3. The process as claimed in claim 1, wherein the alternating electromagnetic field has a frequency in the range from 50 kHz to 1500 kHz.

4. The process as claimed in claim 1, wherein the boron-containing melting material comprises a borate-containing material, a borate glass, or a borosilicate glass with a high boric acid content.

5. The process as claimed in claim 1, wherein the boron-containing melting material comprises a quantitative proportion of alkali-containing compounds of less than 2%.

8. The process as claimed in claim 1, wherein the cooled tubes of the skull crucible are short-circuited in a region of the walls of the skull crucible that is surrounded by a high-frequency coil for emitting the alternating electromagnetic field.

9. The process as claimed in claim 8, wherein the cooled tubes are short-circuited at, in each case, one location.

11. The process as claimed in claim 1, wherein the cooled tubes comprise tubes made from platinum, a platinum alloy, or aluminum.

13. The process as claimed in claim 1, wherein the cooled tubes are coated with fluorine-containing plastic.

14. The process as claimed in claim 1, further comprising adding a batch in pellets form to the appliance.

15. The process as claimed in claim 1, further comprising stirring the boron-containing melting material during the induction-heating.

16. The process as claimed in claim 1, further comprising blowing a gas into the boron-containing melting material.

17. The process as claimed in claim 16, further comprising introducing a bubbling tube into the boron-containing melting material and blowing the gas into the boron-containing melting material through a nozzle of the bubbling tube.

18. The process as claimed in claim 1, further comprising refining the boron-containing melting material.

19. The process as claimed in claim 18, wherein the boron-containing melting material is melted in a first appliance and refined in a second appliance connected in series with the first appliance.

22. The process as claimed in claim 1, further comprising continuously melting the boron-containing melting material in the appliance.

28. The process as claimed in claim 1, wherein the borate-containing, low-alkali material is useful for the production of borate glasses and borosilicate glasses with a high boric acid content for optical applications, the boron-containing melting material comprising:

B_2O_3 45 to 66 mol%,

SiO_2 0 to 12 mol%,

$B_2O_3 + SiO_2$ 55 to 68 mol%,

Al_2O_3, Ga_2O_3, In_2O_3 0 to 0.5 mol%,

$\Sigma M(II)O$ 0 to 40 mol%,

$\Sigma M_2(III)O_3$ 0 to 27 mol%,

$\Sigma M(II)O, M_2(III)O_3$ 27 to 40 mol%,

$\Sigma M(IV)O_2, M_2(V)O_5, M(VI)O_3$ 0 to 15 mol%, and wherein

$X(B_2O_3)$ is greater than 0.78, where

M(II) = Mg, Ca, Sr, Ba, Zn, Cd, Pb.

29. The process as claimed in claim 1, wherein the borate-containing, low-alkali material is useful for the production of borate glasses and crystallizing boron-containing materials, the boron-containing melting material comprising:

B_2O_3 30 to 75 mol%,

SiO_2 less than 1 mol%,

Al_2O_3, Ga_2O_3, In_2O_3 0 to 25 mol%,

$\Sigma M(II)O, M_2(III)O_3$ 20 to 85 mol%, and

$\Sigma M(IV)O_2, M_2(V)O_5, M(VI)O_3$ 0 to 20 mol%, and wherein

$X(B_2O_3)$ is greater than 0.90.

30. The process as claimed in claim 1, wherein the borate-containing, low-alkali material is useful for producing crystallizing borate-containing material, the boron-containing melting material comprising:

B_2O_3 20 to 50 mol%,

SiO_2 0 to 40 mol%,

Al_2O_3, Ga_2O_3, In_2O_3 0 to 25 mol%,

$\Sigma M(II)O, M_2(III)O_3$ 15 to 80 mol%, and

$\Sigma M(IV)O_2, M_2(V)O_5, M(VI)O_3$ 0 to 20 mol%, and wherein

$X(B_2O_3)$ is greater than 0.52.

31. The process as claimed in claim 30, wherein $X(B_2O_3)$ is greater than 0.55.

32. The process as claimed in claim 30, wherein the quantitative proportions are

$\Sigma M(II)O$ 15 to 80 mol%,

$M_2(III)O_3$ 0 to 5 mol%, and

$X(B_2O_3)$ is greater than 0.60.

33. The process as claimed in claim 30, wherein the quantitative proportion of substances selected from a group consisting of Al_2O_3, Ga_2O_3 and In_2O_3 does not exceed 5 mol%.

34. The process as claimed in claim 30, wherein the quantitative proportion of substances selected from a group consisting of Al_2O_3, Ga_2O_3 and In_2O_3 does not exceed 3 mol%, the quantitative proportion of $\Sigma M(II)O$ is in the range from 15 to 80 mol%, and $X(B_2O_3)$ is greater than 0.65, where M(II) = Zn, Pb, Cu.

35. The process as claimed in claim 1, wherein the boron-containing melting material comprises:

B_2O_3 20 to 50 mol%,

SiO_2 0 to 40 mol%,

Al_2O_3 0 to 3 mol%,

ΣZnO, PbO, CuO 15 to 80 mol%,

Bi_2O_3 0 to 1 mol%, and

$\Sigma M(IV)O_2, M_2(V)O_5, M(VI)O_3$ 0 to 0.5 mol%, and wherein

$X(B_2O_3)$ is greater than 0.65.

36. The process as claimed in claim 35, wherein

B_2O_3 is 20 to 42 mol%,

SiO_2 is 0 to 38 mol%,

ΣZnO, PbO is 20 to 68 mol%,

CuO is 0 to 10 mol%,

ΣZnO, PbO, CuO is 20 to 68 mol%, and

Bi_2O_3 is 0 to 0.1 mol%, and wherein

$X(B_2O_3)$ is greater than 0.65.

37. The process as claimed in claim 1, wherein the boron-containing melting material is free of PbO and CdO.

(9) Evidence Appendix

None.

(10) Related Proceedings Appendix

None.